MATERIALS ENGINEERING

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"Additively Manufactured Copper-Chromium-Niobium Alloy: Microstructure, Mechanical Properties, and Heat Treatment"

By

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ABSTRACT

Copper-Chromium-Niobium (Grcop) alloys are readily printable copper alloys which exhibit high conductivity and mechanical performance at high temperature. Copper-Chromium-Niobium alloys express high corrosion and creep resistance and are appealing candidates for aerospace applications. Additively manufactured Grcop alloys are used for high heat flux combustion chambers. During the additive process, cooling lines are manufactured into the combustion chamber, which allows for regenerative cooling during functionalization of the part. The intricate and complex cooling lines inside the chambers are difficult or nearly impossible to replicate with conventional casting methods, thus making additive manufacturing the dominant means of production. Additively manufactured Grcop alloys show unique grain morphologies and precipitation behavior derived from the rapid cooling during the layer-by-layer additive process. This report briefly reviews recent investigations into the microstructures, strengthening mechanisms, conductivity, and tensile behavior of additively manufactured Grcop alloys. These findings are also compared to non-additively manufactured and heat treated Grcop alloys.

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